Research Article

Decision Support System For Student Activity Unit Selection Using Certainty Factor Method

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Abstract: In various fields, including the selection of Student Activity Units on campus, Decision Support Systems (DSS) have become an important tool to assist the decision-making process. SPK provides information and analysis that is structured and easy to understand, thereby helping decision-makers to choose SMEs that best suit their interests, talents, and goals. Choosing the right Student Activity Units for students can contribute to the development of their personal qualities and help develop a variety of social and professional skills. Using the Certainty Factor method in creating a Decision Support System to assist students in choosing Student Activity Units that are most relevant to their desired interests and talents. The Certainty Factor method is an artificial intelligence technique that can overcome uncertainty in data and provide a level of confidence in every decision. Based on trials carried out on several interest and talent characteristics using the Certainty Factor method, percentage results were obtained with a confidence level of 80.26%. Based on the test results, it can be concluded that the expert system created can make it easier to determine talent interests that match student desires.

1. Introduction

Student Activity Units are student organizations at the university level that focus on various specific activities and interests which provide a means for students with similar interests, talents, creativity, and aspirations to express themselves through various extracurricular activities in the campus environment (Nataliyadin et al., 2024)[1]. Student Activity Units aim to develop student potential, improve skills, and help them face challenges outside the academic environment. Through student activity units, students can hone their talents, expand their social networks, and increase their understanding of leadership and management in building a spirit of togetherness and a sense of family among students. Through this activity, students can learn to work together and have the means to expand their social networks (Lowrenza et al., 2022; Khaira et al., 2022)[2][3].

decisions through the use of data, information, and special analysis methods. DSS is used to help decision-makers in dealing with complex situations and has many alternatives that need to be considered (Mawadah et al., 2020)[4]. Various Student Activity Units have an important role in developing student potential and skills. In managing student activity units, various aspects need to be considered, such as the level of student participation, quality of activities, finances, and internal management of student activity units (Yulfian Kurnianto et al., 2012)[5]. Making decisions regarding selecting the right SME requires careful and objective analysis. The selection process is related to major selection and individual growth to obtain the abilities and skills required. students can do this by determining talents and interests. Based on the results of determining interests and talents, you can easily group and plan approaches to developing students' interests and talents (Putra et al., 2021; Wahyuni et al., 2022)[6][7].

Furthermore, to assist the decision-making process, it is proposed to use the Certainty Factor method in the decision support system. The Certainty Factor method can help in making more appropriate decisions by considering the level of confidence in various information (Sunaryo et al., 2021)[8]. By considering the certainty and uncertainty factors of existing information, this method can provide a weight or level of confidence in the alternatives faced (Maryana et al., 2023)[9]. The benefit of using the Certainty Factor method in a decision support system is to help minimize the influence of decisions based on subjective opinions or preferences so that decisions become more objective (Sitio et al., 2021)[10]. One method in a decision support system is the Certainty Factor Method which allows us to overcome uncertainty or ambiguity in existing information. This method works by considering the level of trust or confidence in an event or event. By combining relevant qualitative and quantitative data and factors.

The importance of the role of Student Activity Units (UKM) in student development within higher education institutions. UKM serves as a platform that allows students to channel their talents, interests, and creativity beyond academic activities. UKM not only enhances students' skills and potential but also expands their social networks and provides experiences in leadership and management. However, managing and selecting the right UKM often faces challenges related to participation, activity quality, and internal management. An effective UKM selection process requires objective and data-driven analysis to ensure that students can join UKMs that align with their interests and talents.

In this context, applying the Certainty Factor Method in a Decision Support System (DSS) can be a solution to address uncertainty and ambiguity in decision-making. This method can help make more accurate decisions by considering the level of confidence in various pieces of information and alternatives. This research aims to evaluate how the Certainty Factor Method can enhance objectivity in the decision-making process related to UKM selection and its impact on overall student development.

2. Method
2.1 Research Framework

Research methods may vary depending on the context and scope of the research. The method or approach used to collect data, analyze data, and obtain relevant information in answering research questions or achieving specific research targets. This research method helps in designing a research plan and the stages that need to be carried out to achieve the desired results. valid and reliable. To see further, you can pay attention to the steps taken in this research in Figure 1.
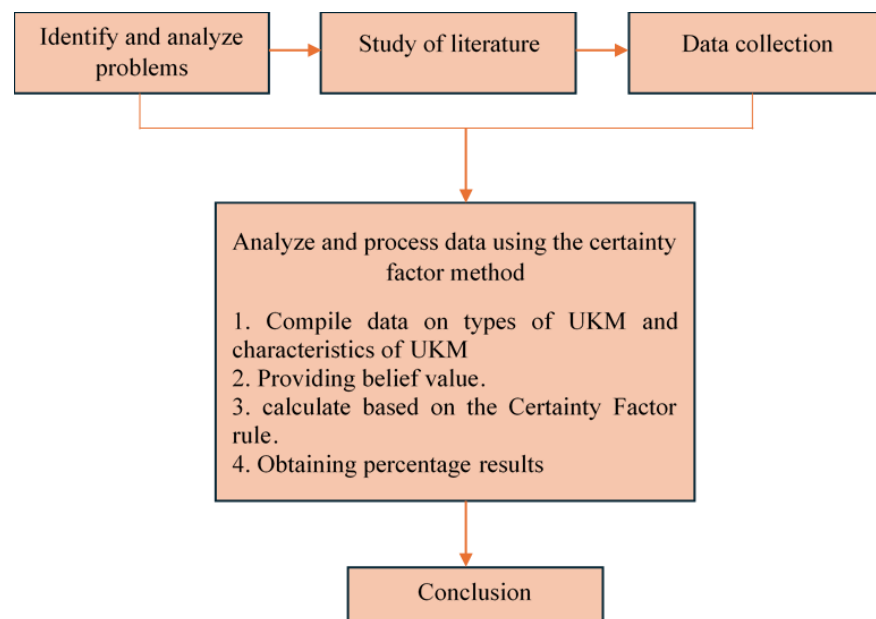

Figure 1. Research Framework

2.2 Identify and Analyze Problems

At this stage in problem-solving, identifying the root of the problem accurately in the first step is very important to determine the right and effective solution. In the context of this research, a lack of understanding of the various types of student activity units on campus as well as a lack of clear information regarding the activities and objectives of each student activity unit are also obstacles (Br. Purba et al., 2022) [11]. As a result, students often feel confused and have difficulty making the right decisions regarding their choice of student activity units, which has the potential to impact their overall college experience. So a decision support system is needed to overcome this problem.

2.3 Literature Review

At this stage, the researcher carries out the process of collecting, reviewing, and analyzing references or sources of information that are relevant to the research topic to be conducted. In this case, the researcher conducted direct interviews with several students about student activity units on campus.

Table 1. Gap Previous research

Year	Author	Research Title	Research Focus	Key Findings	Research Gap
2023	Maryana et al.	"Evaluating the Effectiveness of Certainty Factor Method in DSS"	Certainty Factor method in decision support system	Demonstrate methodological benefits in data-driven decisions.	Not yet applied specifically in the context of SME selection and student development.
2022	Wahyuni et al.	"Student Activity Units: Managing and Evaluating Participation"	SME management, student participation, and activity quality	Identify challenges in SME management and evaluation.	Lack of integration of objective data analysis in SME management and evaluation.
2021	Putra et al.	"Mapping Talents and Interests in University Settings"	Determination of students' talents and interests and their grouping	Provide a method for mapping students' talents and interests.	Has not integrated data-driven decision analysis techniques for SME selection.
2020	Mawadah et al.	"Decision Support Systems in Complex Decision Making"	Decision support systems and analysis methods for complex situations	Discusses the importance of DSS in complex decision-making.	There has been no focus on the application of DSS specifically in the context of SMEs and student development.

2.4 Collecting data

An important step in the research process involves gathering information or facts relevant to the established research topic. The collected data will be used to respond to research questions and test conjectures or identify patterns and interactions between the variables studied.

2.5 Analyzing & Processing Data Using the Certainty Factor Method

Every fact obtained to produce a conclusion will be processed using the Certainty Factor Method. By referring to the data collected during the research process, the following is some of the data used in this research. From the observations that have been made in this research, both from literature studies and interviews, 5 types of student activity units can be identified which will be the focus of researchers.

Table 2. Types of UKM

Code	Name
UKM1	Arts student activity units
UKM2	*Da'wah* student activity units
UKM3	Digital & Multimedia student activity units
UKM4	English student activity units
UKM5	Tarung Derajat student activity units

Table 3. Criteria for UKM Users

Code	Characteristics
K1	Like to read
K2	Likes to write
K3	Likes to tell stories
K4	Likes to talk
K5	Easy to understand new words
K6	Likes to argue with other people
K7	Likes to make speeches
K8	Likes counting numbers
K9	Likes to think scientifically
K10	Likes to do research
K11	Likes to use formulas
K12	Likes to count
K13	Easy to understand the story
K14	Likes to paint
K15	Likes taking photos
K16	Likes to sketch
K17	Likes gymnastics
K18	Active in physical activities
K19	Loves martial arts sports
K20	Likes to play drama
K21	Likes to imitate movements
K22	Enjoys playing musical instruments
K23	Likes singing and dancing
K24	Likes listening to songs
K25	Can compose songs
K26	Easy to understand the rhythm of the song
K27	Participate in choir activities
K28	It's nice to be among many people
K29	Enjoy listening to other people
K30	High self-confidence
K31	Enjoy going out in nature
K32	Hold on to your beliefs

Table 4. Stimulation of student activity units

Name of student activity unit	Stimulation
Arts student activity units	Likes painting, taking photos, sketching, gymnastics, drama, playing musical instruments, singing and dancing, likes listening to songs, can compose songs, easily understands the rhythm of songs, and takes part in choir activities.
Da'wah student activity units	Likes to read, likes to write, likes to tell stories, likes to talk, likes to argue with other people, likes to make speeches, Likes to do research, Easy to understand stories, More likely to prioritize the interests of belief or religion.
Digital & Multimedia student activity units	Likes calculating numbers, doing research, using formulas, making sketches, likes being around lots of people.
English student activity units	Likes to read, Likes to tell stories, Likes to talk, Easy to understand new words, Easy to understand stories.
Tarung Derajat student activity units	Active in physical activities, Likes martial arts sports, Has high self-confidence, and Enjoys going out in nature.

Table 5. Criteria for student activity units based on experts

Code	Unit1	Unit2	Unit3	Unit4	Unit5
K1		√		√	
K2		√			
K3		√		√	
K4		√		√	
K5				√	
K6		√			
K7		√			
K8			√		
K9					
K10			√		
K11			√		
K12					
K13				√	
K14	√				
K15	√				
K16	√		√		
K17			√		√
K18					√
K19					√
K20					
K21					
K22	√				

Code	Unit1	Unit2	Unit3	Unit4	Unit5
K23	√				
K24	√				
K25	√				
K26	√				
K27	√				
K28			√		
K29					
K30					√
K31					√
K32		√			

To express the certainty scale in the Certainty Factor Method, the following are several notations that can be used to carry out calculations. The Certainty Factor formula can be seen in Equation 1.

$$CF[H,E] = MB[H,E] * [MD[H,E] \tag{1}$$

From formula 1, the parameters are explained in detail as follows, CF is the effect of fact E on hypothesis H measured through the Certainty Factor. MB is the effect of fact E on the confidence level of hypothesis H. MD is the effect of fact E on the prediction uncertainty level, E is Evidence (expert confidence scalar), and H is Estimated guess (user confidence scalar). Meanwhile, to combine two or more of the same rules with different uncertainty factors, use the following notation, as shown in Equation 2.

$$CF[H,E]1 + CF[H,E]2 * (1 - CF[H,E]1) \tag{2}$$

3. Result and Discussion

The process of calculating belief presentation begins by breaking down criteria (rules) that have multiple characteristics into criteria with single characteristics. After that, each new criterion is calculated with a Certainty Factor value using the following equation 1. If there are many characteristics of each student activity unit, it will be calculated using the following Certainty Factor equation 2.

As an illustration, let's observe an example of calculations to identify the characteristics of a student activity unit.

1. If you like reading
2. Likes to talk
3. Likes to argue with other people
4. Be active in physical activities

The following is an example of calculating the Certainty Factor for student activity unit 2 (*Da'wah*)

Table 6. Expert Certainty Values

Code	Symptom	CF value
K1	Like to read	0.8
K4	Likes to talk	0.6
K6	Likes to argue with other people	0.6
K18	Active in physical activities	0.2

Table 7. User Certainty Value

Code	Certainty answer
K1	0.6
K4	0.8
K6	0.4
K18	0.2

Student activity unit 2 (*Da'wah*)
CF(H,E) = CF(H) *CF [E]
$\quad$ = 0.8 * 0.6
$\quad$ = 0.48
CF(H,E)2 = CF(H)2 *CF [E]2
$\quad$ = 0.6 *0.8
$\quad$ = 0.48
CF(H,E)3 = CF(H)3 *CF [E]3
$\quad$ = 0.6 *0.4
$\quad$ = 0.24
CF(H,E4) = CF(H)4 *CF [E]4
$\quad$ = 0.2*0.2
$\quad$ = 0.04

Then calculate the Combined Certainty Factor:
Cfcombine CF[H,E]1,2
= CF[H,E]1 + CF[H,E]2 * (1-CF]H,E]1)
= 0.48 + 0.48 * (1-0.48)
= 0.48 + 0.48 * 0.52
= 0.48 + 0.2496
= 0.7296 old

CFcombine CF[H,E]old,3
= CF[H,E]old + CF[H,E]3 * (1-CF[H,E]old)
= 0.7296 + 0.24 * (1-0.7296)
= 0.7296 + 0.24 * 0.2704
= 0.7296 + 0.064896
= 0.79446 old2

CFcombine CF[H,E]old2,4
= CF[H,E]old2 + CF[H,E]4 * (1-CF[H,E]old2)
= 0.79446 + 0.04 * (1- 0.79446)
= 0.79446 + 0.04 * 0.20554
= 0.79446 + 0.0082216
= 0.802681 old3

CFpercentage = CFcombine * 100%
$\quad$ = 0.802681 * 100%
$\quad$ = 80.26%

$\quad$ The calculation results show that the Certainty Factor for Student Activity Unit 2 (*Da'wah*) is 80.27%. This figure reflects the level of confidence that the characteristics of this activity unit align with the specified preferences and tendencies.
This analysis provides valuable guidance in selecting the student activity unit that best matches individual interests and talents. By using the Certainty Factor method, we can combine various pieces of information to produce a more representative and accurate value, which aids in making better-informed decisions. The success of these calculations

indicates that this method can be relied upon for similar applications in evaluation and selection within decision support systems.

5. Conclusion

Formulate conclusions based on the interpretation of data analysis results, resolve research problems, and achieve predetermined research targets. According to the results of calculations carried out using the Certainty Factor method, it can be concluded that the application of an expert system using the Certainty Factor can recognize the criteria for student activity units with a classified accuracy level of 80.26%.

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References

1. Nataliyadin, N. (2024). Analisa Kerusakan Jaringan Internet menggunakan Metode Certainty Faktor: Study Case SimDa Indramayu. Jurnal Komputer Dan Elektro Sains, vol 2, no.2, pp. 22–27. doi.org/10.58291/komets.v2i2.142

2. Lowrenza, D. (2022). Identifikasi Faktor Kegagalan Hasil Produksi Busa dengan Sistem Pakar Metode Dempster Shafer dan Certainty Factor. Jurnal Informatika Ekonomi Bisnis, vol. 4 no. 1, pp. 7-16. doi.org/10.37034/infeb.v4i1.105

3. Khaira, U., Aulia, B., & Musfiroh, D. (2022). Sistem Pakar Rekomendasi Tanaman Herbal Berdasarkan Faktor Lingkungan Menggunakan Metode Certainty Factor. SATIN - Sains Dan Teknologi Informasi, vol. 8 no. 2, pp. 101-111. doi.org/10.33372/stn.v8i2.889

4. Mawadah, S., Andreswari. D., & Efendi. R. (2020). Prediksi Curah Hujan Menggunakan Algoritme Genetika Sebagai Salah Satu Faktor Penentuan Jenis Tanaman Sayuran Dengan Metode Certainty Factor (Studi Kasus: Kepahiang). Rekursif (Jurnal Informatika), vol. 8 no. 2, pp. 176-184.   doi.org/10.33369/rekursif.v8i2.10728

5. Yulfian Kurnianto, a. W. (2012). Aplikasi resep peracikan jamu menggunakan metode faktor kepastian (certainty factor) berbasis android (study kasus depot jamu sumber waras nusantara kepohbaru). Jurnal Mahasiswa Fakultas Teknik, vol. 1 no. 1, pp. 139-150. doi.org/10.30736/.v1i1.110

6. Putra, R. S., & Yuhandri, Y. (2021). Sistem Pakar dalam Menganalisis Gangguan Jiwa Menggunakan Metode Certainty Factor. Jurnal Sistim Informasi Dan Teknologi, vol. 3 no. 4, pp. 227–232. doi.org/10.37034/jsisfotek.v3i4.70

7. Wahyuni, S., & Hasugian, P. M. (2022). Sistem Pakar Mendiagnosa Penyakit Ayam Kampung Menggunakan Metode Certainty Factor. Jurnal Sains Dan Teknologi, vol. 3 no. 2, pp. 60-65.   https://doi.org/10.55338/saintek.v3i2.212

8. Sunaryo, N.., Yuhandri, Y., & Sumijan, S. (2021) Sistem Pakar Menggunakan Metode Certainty Factor dalam Identifikasi Pengembangan Minat dan Bakat Khusus pada Siswa . Jurnal Sistim Informasi Dan Teknologi, vol. 3 no. 2, pp. 48–55. https://doi.org/10.37034/jsisfotek.v3i2.43

9. Maryana, S., & Suhartini, D. (2023). Implementasi Certainty Factor Untuk Diagnosa Penyakit Sapi". CHAIN: Journal of Computer Technology, Computer Engineering, and Informatics, vol. 1 no. 1, pp. 14-20.   https://doi.org/10.58602/chain.v1i1.5

10. Sitio, A. S., & Sianturi, F. A. (2021). Implementasi Metode Certainty Factor dalam Mengetahui Kerusakan Sepeda Motor Type Injeksi. Jurnal Sains Dan Teknologi, vol. 3 no. 1, pp. 1-7.   https://doi.org/10.55338/saintek.v3i1.199

11. Br.Purba, D. E., & Simanjorang, R. M. (2022). Sistem Pakar Diagnosa Gangguan Pencernaan Pada Manusia Menggunakan Metode Certainty Factor. Jurnal Sains Dan Teknologi, vol. 3 no. 2, pp. 36-42. https://doi.org/10.55338/saintek.v3i2.208

12. Sari, Y. " Aplikasi Pengukuran Tingkat Stres Pada Mahasiswa Tingkat Akhir Dengan Metode Certainty Factor". Jurnal Teknik Indonesia, vol. 2, no. 1, pp. 14-28. 2023. https://doi.org/10.58860/jti.v2i1.8

13. Sindi Feliza Dianti, & Suendri. "Sistem Pakar Diagnosa Penyakit Hipotermia Menggunakan Metode Certainty Factor". Jurnal Sistem Cerdas, vol. 6 no. 1, pp. 54 - 64. 2023.   https://doi.org/10.37396/jsc.v6i1.289

14. Lauryn, S. M., Saparudin, A., & Ibrohim, M. "Sistem Pakar Diagnosa Penyakit Hewan Ternak Kambing Dengan Metode Certainty Factor (Cf)". JSiL (Jurnal system Informasi), vol. 8, no. 1. pp. 18-23. 2021. https://doi.org/10.30656/jsii.v8i1.2947

15. Saragi, N. R., Sembiring, A., & Nurhayati. "Sistem Pakar Mendiagnosa Kelayakan Air Minum untuk Dikonsumsi menggunakan Metode Certainty Factor pada PDAM Tirta Sari Kota Binjai". Citra Sains Teknologi, vol. 2 no. 1, pp. 23-26. 2022. https://doi.org/10.2421/cisat.v2i1.63

16. Restiady, A.., Na'am, J., & Nurcahyo, G. "Metode Certainty Factor dalam Mengidentifikasi Claim untuk Kerusakan Ban Mobil Merek Dunlop".   Jurnal KomtekInfo, vol. 9 no. 3), pp.   94–99. 2022.   https://doi.org/10.35134/komtekinfo.v9i3.313

17. Anggraeni, D. P., & Syafrullah, H. (2023). Sistem Pakar Diagnosa Gejala Malnutrisi pada Balita Menggunakan Metode Certainty Factor. Jurnal Informasi Dan Teknologi, 5(4), 67-72. https://doi.org/10.60083/jidt.v5i4.419

18. Armet, S. (2023). Metode Certainty Factor dalam Mengidentifikasi Gangguan Koneksi Internet pada Metro Ethernet. Jurnal Informasi Dan Teknologi, 5(1), 1-6. https://doi.org/10.37034/jidt.v5i1.224

19. Azzahra, B., & Prasetyaningrum, P. T. (2024). Analisis Perbandingan Metode Certainty Factor Dan Dempster Shafer Theory Pada System Pakar Untuk Mendeteksi Penyakit Virus Parechovirus Pada Balita. Innovative: Journal Of Social Science Research, 4(3), 17389–17400. https://doi.org/10.31004/innovative.v4i3.12630

20. Handrizal, Zamzami, E. M., & Arif, M. (2021). Expert System in Periodontal Diseases Diagnosis Using the Certainty Factor Method. Journal of Physics: Conference Series, 1898(1), 0–8. https://doi.org/10.1088/1742-6596/1898/1/012004